



Here's The Information Smart Data Collectors Display...

Following is information displayed by the SDC-301 following the monitoring of a 30-year old household refrigerator. The data given by Smart Data Collectors are amalgamated readings providing vital statistics. To the right of the screen data, interpretation is given to show how troubleshooting and energy management information can be quickly gleaned.

MAIN MENU (c)2002-4 Tivpro, Inc. S/N 11B
PAUSED

Time From Start = 0d 7h 53m 8s (days, hours, minutes, seconds)
Battery Level = 1 (35 = NEW)

CURRENT SENSOR = "YES" ("YES" = above Set Point)
Percent "YES" = 44.4% ("NO" = below Set Point)

EXTERNAL SENSOR 2 = 4.7 Amps
Average = 2.0 Amps

EXTERNAL SENSOR 3 = 30.9 degrees F
Average = 37.0 degrees F

EXTERNAL SENSOR 4 = 0.3 degrees F
Average = 2.7 degrees F

CURRENT SENSOR - Time Information S/N 11B
PAUSED "YES"

Time From Start = 0d 7h 53m 8s Set Point = 4
Total Time "YES" = 0d 3h 30m 3s Percent "YES" = 44.4%
Total Time "NO" = 0d 4h 23m 5s Times "YES" = 19

FROM START - SHORTEST "YES"	FROM START - SHORTEST "NO"
day hr. m.- hr. m. s.	day hr. m.- hr. m. s.
0 4 45 : 0 4 58	0 0 20 : 0 13 25
0 5 55 : 0 5 7	0 1 10 : 0 13 10
0 6 15 : 0 5 7	0 2 50 : 0 13 34
0 7 5 : 0 5 4	0 6 50 : 0 13 38
0 7 20 : 0 4 59	0 7 25 : 0 13 39

FROM START - LONGEST "YES"	FROM START - LONGEST "NO"
day hr. m.- day hr. m.	day hr. m.- day hr. m.
0 0 0 : 0 0 22	0 3 40 : 0 0 14
0 0 55 : 0 0 17	0 4 30 : 0 0 14
0 1 45 : 0 0 17	0 4 50 : 0 0 14
0 3 25 : 0 0 17	0 6 20 : 0 0 14
0 4 15 : 0 0 17	0 7 10 : 0 0 14

The **Main Menu** screen shows that monitoring took place for just under 8 hours. It also indicates that battery replacement is needed.

We see that the unit ran 44.4% of the time during monitoring (**Not great for a new refrigerator, but acceptable for one of this vintage – perhaps cleaning the condenser will improve cooling efficiency**) and that we had an Amps Draw sensor and two (2) Temperature sensors hooked up (**Sensor 3 monitored temperature in the freezer section, while Sensor 4 was place in the refrigerator**).

We can calculate energy use and cost based on the average draw of 2.0 Amps (2 Amps x 120 Volts = 240 Watts. Multiply this by 24 hours to obtain KW per day, then multiply by cost of electricity to get operating cost.

Detail information from the Current Sensor includes the monitored time with breakdown on actual time on "YES" and off "NO". The percent "YES" is 44.4 and the unit started 19 times during monitoring. (**By dividing the time monitored by the times the unit came on you can see that it cycled about 2 ½ times an hour.**)

Set Point indicates that it was set to measure above minimal current (**The refrigerator light did not register as "YES"**)

The 5 shortest "YES" events are very consistent at about 5 minutes, indicating no short cycling problems. The 5 longest "YES" events are also consistent at 17 minutes with the exception of the first event, which occurred at the beginning of monitoring. (**We might question the 12 minute disparity between the two.**)

The 5 shortest "NO" events are very consistent in the 13 minute range, while the 5 longest "NO" events are also consistent at 14 minutes. (**This would indicate that there is no heat loss or insulation problems and the compressor is functioning well.**)

EXTERNAL SENSOR 2 - Amperage Information S/N 11B
PAUSED **CONNECTED**

Collected From: 0d 0h 0m 2s To: 0d 7h 53m 8s (From Start)

Now = 4.7 Amps
Average = 2.0 Amps
Lowest = 0.1 Amps : 0d 4h 10m (From Start)
Highest = 5.0 Amps : 0d 5h 25m (From Start)

AMPERAGE RANGE - % OF TIME

0.0 A - 2.4 A : 55.6 %
2.5 A - 4.9 A : 44.4 %
5.0 A - 7.4 A :
7.5 A - 9.9 A :
10.0 A - 12.4 A :
12.5 A - 14.9 A :
15.0 A - 17.4 A :
17.5 A - 19.9 A :
20.0 A - 22.4 A :
22.5 A - 25.0 A :

EXTERNAL SENSOR 3 - Temperature Information S/N 11B
PAUSED **CONNECTED**

Collected From: 0d 0h 0m 2s To: 0d 7h 53m 8s (From Start)

Now = 0.3 degrees F
Average = 2.7 degrees F
Coldest = - 3.0 degrees F : 0d 4h 30m (From Start)
Warmest = 8.9 degrees F : 0d 0h 0m (From Start)

FROM START - COLDEST DIP	FROM START - WARMEST PEAK
day hr. m.- deg f	day hr. m.- deg f
0 2 50 : - 3	0 0 0 : 9
0 3 40 : - 3	0 4 15 : 8
0 4 30 : - 3	0 5 25 : 8
0 5 40 : - 3	0 6 30 : 8
0 6 50 : - 3	0 7 40 : 8

EXTERNAL SENSOR 4 - Temperature Information S/N 11B
PAUSED **CONNECTED**

Collected From: 0d 0h 0m 2s To: 0d 7h 53m 8s (From Start)

Now = 30.9 degrees F
Average = 37.0 degrees F
Coldest = 30.1 degrees F : 0d 4h 30m (From Start)
Warmest = 42.6 degrees F : 0d 0h 0m (From Start)

FROM START - COLDEST DIP	FROM START - WARMEST PEAK
day hr. m.- deg f	day hr. m.- deg f
0 2 45 : 31	0 0 0 : 43
0 3 35 : 30	0 0 55 : 41
0 4 30 : 30	0 1 45 : 40
0 5 35 : 30	0 2 30 : 40
0 6 45 : 30	0 7 40 : 39

Detailed information from the Amps Draw sensor shows that the unit operated within a 5 Amp Draw range. The 2.0 Amp average that was used to calculate energy use is shown again.

A breakdown of ranges by 10% values is given for this sensor (0-25 Amp). It indicates that it operated in the high range, 2.5-4.9, for 44.4% of the time. **(This corresponds exactly to the 44.4% "YES" reading from the Current sensor, meaning that there were no hard starting problems where Amp Draw spiked and that the unit spent very little time in start mode)**

The detailed information from the Temperature sensor 3 that was placed in the freezer section of the unit shows average temperature of 2.7 degrees F.

The 5 coldest dips are very consistent at -3 degrees. The 5 highest peaks are also consistent at 8 degrees with one anomalous reading of 9 degrees, occurring at the beginning of monitoring. **(This reading can be disregarded since it is took place in the first minute of monitoring and most likely results from the sensor itself being warmer than the freezer being monitored.)**

The consistency in the peak and dip readings allows us to calculate a meaningful differential temperature – Delta T - calculation of 5 degrees.

Detailed information from the second Temperature sensor (4) in the refrigerator provides information, which correlates well with the data from sensor (3).

Again, if we delete the outlying peak reading at the beginning of monitoring, we see that dip and peak temperature readings are very consistent. **(There is a 10 degree Delta T that is less than optimal and some adjustment to airflow from the freezer compartment may be indicated.)**

The conclusions we can reach from this monitoring session is that the unit functions well for a 30-year old piece of equipment. It is not as energy efficient as a new unit and replacement for those reasons might be considered. Some improvement in operation might be realized by adjusting airflow to the refrigerator and cleaning the condenser.